Expectation, motivation, engagement and ownership: Using student reflections in the conative and affective domains to enhance residential field courses.

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Abstract

Residential field courses are important and should be designed and delivered to maximise their value to students, staff and institutions. In this context we use a novel approach involving analysis of the daily affective and conative reflections of students immersed in the field course experience to better understand student engagement with fieldwork. We show that students base their field course choice on a range of factors (costs and benefits) and that these choices subsequently influence student expectations and motivation to engage with fieldwork. We also show that the motivation of students to engage with fieldwork based learning varies from person to person and from day to day. Our findings suggest that having a more nuanced understanding of the decisions students make when deciding which field course to enrol upon would enhance our ability to design attractive, accessible and useful field courses; that having an awareness of the expectations of students around field courses would enable us to better prepare them to undertake them; and, that students are more motivated when they are afforded an opportunity to work independently and perceive themselves to have ownership of their learning.

Key words

Field course; fieldwork; motivation; engagement; reflection

Introduction

Residential field courses are essential components of undergraduate degree programmes in the Environmental Sciences (Biology, Ecology, Geography, Geology etc.) (e.g. Brannstrom & Houser, 2015; Maskall & Stokes, 2008; Scott et al., 2012). Field courses facilitate deeper and transformative learning (Boyle et al., 2007), enabling students to connect theory and practice (Gibson, 2007; Welsh & France, 2012); to develop discipline specific skills and knowledge (Scott et al., 2012); and to develop transferable skills (e.g. communication, team working and criticality) (Arrowsmith, Bagoly-Simó, Finchum, Oda & Pawson, 2011). The immersive nature of residential field courses can also serve to focus the attention of students on their learning in a way that increases their motivation (Ballantyne, Anderson & Packer, 2010). Graduates in the Environmental Sciences often refer to a residential field course as being one of, if not the, highlight of their undergraduate degree (*pers obs*). They may also enable students to demonstrate that they have the experiences, skills and professional competencies valued by employers (Arrowsmith et al., 2011; Welsh & France, 2012). University managers recognise their value in enhancing institutional reputation (Munge, Thomas & Heck, 2018); in attracting students to enrol on their courses (Maw, Mauchline & Park, 2011; Stokes & Boyle, 2009); and in enhancing student retention (Bester, Muller, Munge, Morse & Meyers, 2017; Millenbah & Millspaugh, 2003). These benefits of field courses have been usefully discussed and summarised by Munge, Thomas and Heck (2018) among others.

However, in-spite of their academic, social and reputational benefits field courses are not valued to the same extent by all stakeholders. Wilson, Leydon and Wincentak (2016) have suggested that in Canada there is a perception that fewer students with a genuine motivation to undertake fieldwork enrol upon geography programmes than has previously been the case. The motivation/willingness of students to participate in fieldwork varies and even within the environmental disciplines that count fieldwork as a signature pedagogy not all students want to do fieldwork and not all who participate value/enjoy it to the same extent (Boyle et al., 2007; Goulder, Scott & Scott, 2013). Cost, conflicting time pressures, issues around inclusivity and employment schedules have all been raised as potential barriers to student participation in field courses (Hall, Healy & Harrison 2002; Hughes 2016; Smith, 2004). As class sizes have increased and curricula have become more crowded field courses have become more expensive, more difficult to organise, and more difficult to staff (Higgit, 1996; Mauchline, Peacock & Park, 2013; Mullens, Bristow & Cuper, 2012; Wilson et al., 2017). These pressures have resulted in a decline in fieldwork provision in some areas and at times field courses have been described as being under threat (Smith 2004). Declining field course provision has been documented in Australia (Burke da Silva, 2014), in North America (Mullens et al., 2012) and in the United Kingdom (Maw, Peacock & Park, 2011; Smith 2004). In Canada Wilson et al. (2017) suggest

that levels of fieldwork provision are not currently adequate (fewer than half of the departments they considered required students to undertake fieldwork). Recently however Mauchline et al. (2013) have suggested that the situation in the biosciences in the UK has improved, reporting a perception that as a minimum the decline in the amount of fieldwork undertaken had been halted and in some cases that it had been reversed.

Drawing all of the above together it is clear that field courses are important, but it is also clear that if they are to persist in the curriculum they should be designed and delivered to maximise their value to students, staff and institutions. We believe that our study makes a positive contribution in this context. Our over-arching aim was to evaluate student engagement with three field courses with broadly similar learning outcomes but which represent very different levels of investment and opportunity on the part of students. We note that published field course evaluations tend to adopt a pre/post trip questionnaire/interview approach to evaluate the importance of fieldwork as practice in the acquisition of disciplinary knowledge and in the development of technical and personal skills and competencies. This approach is valuable if the aim is to measure the knowledge/skills gained by students but it has the limitation that it inevitably places some distance between the occurrence of the experiences of students and their reflections upon them, and it may therefore result in the field course being conceptualised by both staff and students as an extended homogenous learning event. However, field courses are in fact composites of a range of sometimes quite diverse learning events presented in a concentrated block. It is our experience, and that of others (e.g. Dunphy & Spellman, 2009; Ishii, Gilbride & Stensrud, 2009; Simm & Marvell, 2015) that individual students respond to, and engage with individual events across the field course differently. Residential field courses expose students to new and unfamiliar locations and cultural environments which may be both physically and personally challenging (della Dora, 2011; Nieto, 2006), and field courses may therefore represent an example of a disruptive learning space (Savin-Baden, 2008) where students attempt to develop an understanding of the congruence (or lack off) between their prior expectations and current experiences. Through our personal practice as educators providing students with opportunities to undertake residential field courses in the biological and environmental sciences we most frequently consider the physical and intellectual challenges experienced by our students, and as a consequence we scaffold our teaching around the cognitive (e.g. aquiring new knowledge) and psychomotor (becoming competent in new practical field skills) domains, both of which are relatively well researched in the pedagogic literature (Simm & Marvell, 2015). A number of authors have suggested that in order to fully understand and evaluate the student field course experience it is important to also consider both the affective domain (concerned

with personal values and emotional responses) (Blair & Deacon, 2015; Golubchikov, 2015; Simm & Marvell, 2009) and the conative domain (concerned with personal motivations) (Blair & Deacon, 2015), both of which are relatively under researched.

In this study we have focused particularly upon the *motivations*, *expectations* and *experiences* of students *during* the field course through an analysis of their affective and conative responses to learning experiences. In doing so we have taken a somewhat novel approach and rather than comparing pre- and post-trip experiences and opinions of students we focus upon student expectations of fieldwork and student engagement with fieldwork on a day-to-day basis throughout the course. Our objectives were to: 1) understand how student choice of a particular field course is related to engagement within a field course; 2) establish student expectations at the outset of the field course, and their perceptions of the level to which they are met during it; and 3) understand the day-to-day motivation of students to undertake fieldwork within the field course context. As a result of this evaluation our secondary aim was to be in a position to make recommendations for optimal field course design.

Methods and Results

The students and field courses involved

35 students from two UK universities attended the three field courses that are the focus of our study. 11 students (6 male and 5 female, average age 22) completed a 5 day course at the Field Studies Council Field Centre on the Isle of Cumbrae (Scotland); 13 students (8 male, 5 female, average age 21) completed a 7 day course on the North of the island of Mallorca residing in Port d'Alcúdia (Spain); and, 11 students (3 male, 8 female, average age 22) completed an 8 day course within the Atlantic Rainforest of Vale Reserve (Brazil). The students were all about to enter the final year of a range of undergraduate programmes in the Geographical/Environmental Sciences (4 students) Marine Sciences (8 students) and Biological Sciences (23 students) at two mainstream English universities. Only the Scotland field course involved students and staff from two universities and participants in the Brazil and Mallorca field courses were all from the same university. In Scotland and Brazil staff and students were accommodated at field stations, in Mallorca they stayed in a tourist hotel. University staff taught all components of the Scotland and Mallorca courses but while University staff were present during all sessions of the Brazil course local experts delivered some of the teaching. All courses were subsidised by the student's own university, but as is

increasingly the case students were asked to make a financial contribution to the more expensive courses (Scotland students made their own way to the field course but did not make a direct financial contribution, Mallorca students made a £300 contribution, and students on the Brazil field course made a £1300 contribution).

Each field course involved a combination of guided and independent learning. During guided learning sessions the students were introduced to fieldwork locations and (re)-introduced to field techniques and data collection protocols by the University staff through a series of tutor designed group-based learning activities. They were encouraged towards active learning through purposeful questioning and in-situ problem solving. During the small group based independent learning sessions the students were required to formulate, design and implement small-scale hypothesis-testing projects incorporating the locations/techniques introduced to them during the guided sessions. In Scotland and Mallorca the guided learning preceded the independent learning, in Brazil it was necessary to intersperse the two (see figure 1) and the students had a more limited range of options for independent project design because their projects needed to sit within the framework of fieldwork offered by the field station. However, in spite of this constraint the students were able to make key decisions about hypotheses to be tested and data collection/analysis protocols and so the University staff did consider the Brazil projects to be independent student work.

Data collection

Data were collected directly from individual students who were invited to write their responses to prompt questions in a pre-printed booklet. To understand why students chose a particular destination and to establish student expectations at the outset of the field course we asked *Why did you choose this particular field course?* and *What three words sum up your thoughts about your upcoming field course?* during a briefing meeting at the beginning of the field course. To establish student perceptions at the conclusion of the field course we asked *What three words sum up this field course?* during the end of trip de-briefing meeting. To understand the day-to-day motivation of students to undertake fieldwork within the field course context we have adapted elements of the balanced reflective practice advocated by Blair and Deacon (2015) who have suggested that *in action* reflection (immediately before, during and after fieldwork) focusing separately upon each of the four dimensions of learning (the cognitive, psychomotor, affective and conative domains) recognised by Bloom and colleagues (e.g. Bloom, Englehart, Furst, Hill & Krathwohl, 1956; Krathwohl, Bloom &

Masia, 1964) results in balanced reflective practice that can lead to a more holistic approach to fieldwork among practitioners. During a briefing session at the outset of each field course students were given a short introduction to the research project and the process of data collection and took part in a discussion about Blooms learning domains and the terminology around them as preparation for the task. Specifically, because we were interested in the motivation of students to engage with fieldwork we developed two questions from the work of Blair & Deacon (2015) to prompt our students to consider the learning/fieldwork that they are about to embark upon. The first question was related to their feelings and emotional responses towards the site of the fieldwork they were about to undertake (a question in the affective domain), and the second focused specifically upon their immediate motivation to undertake the fieldwork activity (a question in the conative domain). Prior to each fieldwork activity students were asked to take a few moments to reflect upon the work that they were about to undertake and respond to the following questions in the form of a short written statement:

How do you feel about this site emotionally and aesthetically? Why?

How motivated do you feel at this site? Why?

Throughout our analyses we have taken the decision to focus on the individual reflection rather than the individual student as the unit of interest. We acknowledge the potential for pseudo-replication that arises as a result (one student may contribute up to six reflections) but feel that the unique nature of each field-based activity overcomes this to a sufficient degree. For statistical purposes, we present results at the reflection and the student levels, using non-parametric analyses that are less prone to the degrees of freedom errors associated with pseudoreplication. Student responses to these questions and their own reflections have then been used to develop emergent themes as part of a 'Grounded Theory' approach (Atkins & Wallace, 2012; Glaser & Strauss, 1999) to develop a possible explanation of emerging patterns of motivation and engagement. Through this approach data analysis proceeds first without an initial hypothesis (unlike the traditional positivist approach) and instead through exploration of the data a theory, theoretical framework or hypothesis are constructed.

Why this field course?

All 35 students responded to the question *Why did you choose this particular field course?* (11 Scotland; 13 Mallorca; 11 Brazil). From their responses we identified six key themes that are summarised in Table 1.

Given that the majority of the students taking part in these field courses were enrolled on a biological/environmental degree programme it is perhaps not surprising that students often cited an interest in the fauna/flora/habitats of a location as a reason for choosing the trip. Scotland students often linked this to career aspiration (UK based conservation for example), whereas Mallorca, and particularly Brazil students tended to emphasise the novelty of the species/habitats involved and the unique opportunity with which they were afforded (two of these students explained that they had already been to Scotland and Mallorca). Novelty was not a theme raised by Scotland students who were more likely to refer to past experience and familiarity with the setting and habitats/species around which the field trip was designed.

All of the students who made reference to employability or to CV enhancement stated that the trip they had opted to take part in would benefit them. Although no student provided clearly articulated details about their career of choice or about the tangible benefits involved, the Scotland students were perhaps the most direct:

> '*This trip was a great chance for me to further study UK wildlife, preparing me for a job in the UK*' Scotland student.

> '*It* [the Scotland trip] *relates much better with the career path (wildlife conservation) that I want to pursue and will hopefully help to further my understanding of biology'* Scotland student.

The Mallorca and Brazil students were less clear, simply stating that the experience would '*look good*' on a CV, or that they were '*aiming for a career in this area*' without actually defining the area. It is not clear how these students perceive the link between their experience and future employment and we believe that it is therefore likely that any link is a weak one.

> '*I chose this trip* [Brazil] *as I may never experience this type of environment again and it will look very good on my CV*.' Brazil student.

Students choosing the Scotland field trip made positive comments about the location being close to home (short distance to travel) and about Scotland being somewhere that they had an existing affinity for. Although one student made what we interpret as a partly negative comment stating:

'*This was my second choice after Brazil, I felt the Brazil trip was a unique opportunity however this* [Scotland] *trip was a great choice to further study UK wildlife'* Scotland student.

Similarly both of the students who made a negative comment with respect to their participation in the Mallorca field trip stated that Brazil would have been their preferred destination in absence of personal barriers (see below).

Monetary cost was referred to as a barrier to participation in the Mallorca and Brazil field courses by four of the Scotland students. The remaining student expressed the same constraint in a more positive fashion by stating that the Scotland field trip offered '*value for money*'. Similarly the Mallorca students reported that the trip was priced within their budget envelope (a positive response, but one perhaps suggesting that they may have felt that Brazil was too expensive). The Brazil student who raised the issue of cost did so the context that although they could afford the trip they had chosen it because it was less expensive than an alternative opportunity (one that is not considered in the current study).

Climate was also raised as a factor in field course by four students; three Scotland students all stated that they had chosen to avoid Mallorca/Brazil because they were too hot, and one Mallorca students stated that a warm sunny climate was important to them. Two additional themes were each raised by a single student: One student chose Scotland because they believed that it would be safer than an overseas trip; and one student chose Mallorca because the trip dates fitted around their employment constraints.

The views of students at the onset and conclusion of the field trips.

The responses of students to the 'three-word questions' were collated as word-clouds and are presented in figure 2. From the pre-trip word clouds (figure 2a, 2c, 2e) it is evident that all students were excited at the prospect of the field course that they were about to complete. Scotland students expected their trip to be challenging and subsequently reported it as having been challenging. From these data however it is not clear if the perceived challenge was an intellectual, social or physical one. Those students about to complete an overseas field course reported anxiety (80% of Brazil students and 40% of Mallorca students). None of the Scotland students used this word, but it is possible that the word challenging was used in this context. Post trip perceptions of the three field courses varied (figure 2b, 2d, 2f); Scotland and Mallorca students reported their trips were fun/enjoyable and to some level exhausting and educational. However, Brazil students appear at that stage to have had a less positive view; 30% reported the trip as being exhausting; 30% as stressful; and, 20% as unorganised.

Potential consequences of choice

From the results presented thus far it is clear that the three field courses represent very different levels of monetary and social investment on the part of students. It also appears that not all students are able to participate in the course that would be their first choice in an ideal world. We believe that their expectations of the field course need to be considered in this context. We believe that high expectations probably put pressure on students, staff and destinations to 'deliver'; low expectations may induce limited levels of student motivation/engagement.

Student engagement with learning during the field courses.

Upon arrival at the fieldwork location each day students were asked to take a few minutes to complete an in-situ reflection and to write their responses to questions designed to guide their reflection towards the affective and conative learning domains.

Reflections in the affective and conative domains.

Our thematic analysis revealed to us that student reflections revealed either a positive or negative affective response towards the impending fieldwork. Conative reflections revealed that the students were, or were not motivated to engage with fieldwork. Each Scotland student had an opportunity to complete five pre-activity reflections, Mallorca and Brazil students could chose to complete six (not all students completed every reflection and our analysis is based upon 51 Scotland reflections, 69 Mallorca reflections and 44 Brazil reflections in the affective domain, and 52, 69 and 50 reflections in the conative domain). The data are further categorised in relation to the learning activity type undertaken (guided or independent). The outcome of this categorisation of the data is presented in table 2, which presents the numbers of reflections by students allocated to each of the categories and indicates the numbers of individual students making reflections in each category. In table 2 we also present the results of statistical analyses (exact binomial tests) to compare the ratios of positive to negative, and motivated to not motivated reflections in each category to a 1:1 hypothetical expectation. Students were more likely to make a positive affective statement than a negative one and more likely to state that they were motivated than not motivated in all cases, but the difference was not statistically significant in four situations (affective statements Mallorca independent learning and Brazil guided learning; conative statements Brazil guided learning and independent learning).

Affective reflections

During the guided learning phase of the trips Scotland and Mallorca students expressed a sense of satisfaction with, or connection (current or nostalgic) to, the place in which they found themselves:

> "*Absolutely love this shoreline and feel completely at home with conditions such as these* [presumed reference to weather] *on a Scottish Island"* Scotland student.

> "*It feels like home in the summer and my holidays in Italy as a kid"* Mallorca student.

> "*The site is beautiful and is teeming with bird life"* Mallorca student.

The small number of Scotland and Mallorca students expressing a negative view focused upon personal discomfort/anxiety (working with strangers; working on new things; being bored) and/or intrusions of society upon their sense of place (traffic; proximity to industry). The reflections of the Brazil students reveal a slightly different picture. 55% of the time these students did write a positive reflection and in common with their peers on other field courses they most often referred to their setting (a sense of peace and an appreciation of natural beauty). 45% of the time Brazil students wrote negative reflections which focused upon their anxieties around the potential dangers of the site (scratches, stings and bites; insects and spiders) and upon the fact that the site did not meet their expectations. These students wrote about being *"disconnected from the pristine forest*" (Brazil student). During the independent learning phase the proportion of reflections that were positive increased in all cases and significantly more Scotland and Brazil reflections were positive (Table 2). In these reflections the students focused again on a sense of place, valuing the aesthetics and tranquillity of the space and its' disconnect from the built environment. Some of the Brazil students particularly valued the fact that their expectations and experiences were more aligned:

> "*Feels tropical and exotic. Very beautiful and relaxing. Looks unaffected by humans which makes me happy*" Brazil student.

Negative reflections during the independent learning phase focused on personal problems (Scotland and Mallorca), on the negative impact of society upon the site (Mallorca and Brazil), and some Brazil students still felt that their expectation of a tropical forest had not been met:

> *"Drier than I thought it would be. Fewer organisms."* Brazil student.

> *"I'd prefer it if it was more rainforest and less built up"* Brazil student.

Conative reflections

During the guided learning phase students made reference to a broad range of factors that they linked to higher or lower levels of individual motivation to undertake fieldwork. Scotland and Mallorca students who reported that they were motivated (positive conative reflections) explained their motivation by connecting it to being interested in the species/habitats/topic to be studied (Mallorca students often added that the species/habitats were novel to them) and prior to several of the fieldwork sessions they linked their positive motivation to the fact that the weather was good for fieldwork. Several of the Scotland students also explained that they were motivated because they were prepared for the learning that was about to take place. The Brazil students connected their positive motivation to the novelty of their surroundings and of the species and habitats that would be encountered. Several students stated that they were motivated because they were excited.

However, not all students reported being positively motivated during the guided learning phase of the courses. Scotland students made reference to poor weather (it was cold and it was raining) to explain their low level of motivation prior to some sessions. Similarly, Mallorca students often 'blamed' the weather (in their case it was too hot); some made reference to being too tired to complete the fieldwork or suggested that the task before them was too strenuous. One Mallorca student stated that they were not motivated because they would like the opportunity to relax and be a tourist. Brazil students linked low motivation to being too hot, feeling unwell/tired, feeling apprehensive (about the possibility of bites and stings), and one student expressed the view that there was not enough work to do (which we interpret as a suggestion that the learning session about to be undertaken may have been perceived to be a 'Cooks Tour' lecture out doors rather than a participatory exercise).

During the independent learning phase the students made reference to a narrower range of factors that they linked to higher levels of motivation. A number (3) of the reflections recorded by Scotland students who stated that they were motivated during the independent learning phase made reference to good weather. Almost all of the Scotland student reflections made reference to being motivated to collect data and the majority of them made reference to the fact that they were working on their own project. Similarly the Mallorca and Brazil students referred directly to the fact that they were working on their own project, or described their enthusiasm for the topic that they had chosen to study (which we interpret as an expression of project 'ownership').

Fewer students expressed low motivation during the independent phase than during the guided phase, but one Scotland student stated that they were not motivated because they still had data collection to do (we believe that they were anxious that they would miss their deadline). Two Mallorca students reported low motivation, one was too tired to work and the other wanted to relax and join tourists swimming at the field site. Five Brazil students lacked motivation because they were tired, because they were not working on their own project, and because they perceived the fieldwork to be disorganised and repetitive. We believe that this is a response to the fact that in this case the freedom for truly independent working was more limited than was the case in the other field courses and as a result of this student feedback we have reconceptualised this field course (figure 1).

Discussion and implications for practice

Although there is a view that over-reliance on feedback from students who themselves have little or no pedagogic experience to inform curriculum design might be a case of 'the tail wagging the dog' (Shah, Cheng & Fitzgerald, 2017) we contend that an evaluation of student reflections on their in-situ experience of fieldwork does provide educators with an invaluable insight into the ways in which the courses they design are experienced by students who take them. Based upon our findings we suggest that structured reflections built into field courses enable both tutors and students to monitor and perhaps self-regulate in-course levels of engagement and motivation. Furthermore by recording individual reflections on a day by day basis both educators and students are able to recognise changes in individual attitude and attributes as a result of fieldwork. This is important because the ability of students to recognise and reflect upon an initial sense of discomfort and increasing sense of comfort with time and familiarity during a field course will for example help them to develop a sense of their personal interaction with the field course location and perhaps in turn develop a sense of place (Simm & Marvell, 2015). The development of a sense of affinity with the 'place' in which the field course is situated may enable students to develop a sense of 'possession' when coupled with control over elements the activities undertaken (in our case through independent work) and thereby facilitate the development of a sense of ownership of learning (Simm & Marvell, 2015). In our study students often linked 'place' and 'possession' in a positive association as drivers of increased motivation and engagement.

Henri, Morrell and Scott (2018) have suggested that whilst it is undoubtedly important that students are provided with opportunities to be independent or autonomous and to 'own' their learning it is also important to enable students to recognise their autonomy. Boud, Keogh, & Walker (2013) have suggested that the integration of self-reflective exercises within learning frameworks might be an appropriate way to support students in the development of a personal recognition of their learner autonomy, and Yang (1998) has observed that students who maintain a continuous reflective diary demonstrate enhanced learner autonomy. However, Glass (2015) has also shown that students may find reflexive practice difficult without prior training and that the value of student reflection as part of a short-term field course may be limited if students are ill prepared or if the field course lacks dedicated space for purposeful reflection to take place.

Managing and meeting student expectations

In common with a range of authors, we have shown that when deciding which field course to attend students make a judgement that requires them to balance a range of actual and potential costs and benefits. Key among the costs raised (often conceptualised in the literature as barriers to participation) are financial cost (see also: Fleischner et al., 2017 and Maw et al., 2011), social costs (time spent away from family, work, etc., and pressure to conform to the social culture of the course) (see also: Cotton & Cotton, 2009; Durrant & Hartman, 2015; Hall, Healy & Harrison, 2002), and anxieties around risk. Although the focus of this paper is residential field courses we acknowledge that the financial and social costs of field courses, and to some degree anxiety associated with novelty might be mediated if more use is made of the field sites that are available on or close to campus (Peacock, Mewis & Rooney, 2018) or if the benefits of a residential course can be realised through non-residential alternatives, such as the classroom-based field course advocated by (Hovorka & Wolf, 2009). However, we believe that the well documented benefits of residential field courses outlined in the introduction to this paper (and the references there-in) more than adequately reinforce the view that it is important that these barriers to participation/engagement in residential courses are overcome.

The positive drivers of residential field course choice raised by our students focused upon a desire to visit a particular location because they had been before or because the field course offered an opportunity to visit somewhere new (see also Arcodia, Cavlek & Abreu-Novais, 2014 who record

similar motivations on the part of tourism students undertaking field trips), and an expectation that the course would have particular employability enhancement benefits. However, even acknowledging the potential limitations of our data collection protocol (short, snap shot self-reflections) the level to which expected benefits were explained was quite superficial and like others we feel that the students may lack an ability to clearly articulate the linkages between the field course experience and the development of their *curriculum vitae* (see also France et al., 2016; Scott et al., 2012; Stokes & Boyle, 2009; and, Wakeham, 2016). These findings suggest two things to us. Firstly, that having a more nuanced understanding of the decision making process that individual students undertake when deciding which field course to enrol upon (or even whether to undertake a field course at all) would make it easier for us to design field courses that are attractive, accessible and useful. This should therefore be a priority area for future research in this field. Secondly, that having an awareness of the expectations of our students (hopes and fears) around field courses would enable us to better prepare them to undertake them.

The importance of preparation for fieldwork has been highlighted by Maskall and Stokes (2008), particularly with an emphasis on introducing to students the learning that will take place and the learning activities that they will undertake. However, our feeling is that while they may prepare students for learning (e.g. Herrick, 2010; Hill & Woodland, 2002) pre-course lectures or briefings delivered by teaching staff to students about to choose a field course can only prepare students to a limited degree and to fully prepare students a different approach is needed. One strategy might be to invite students to undertake preparatory virtual field trips perhaps incorporating 360^{o} immersive video of the places and activities involved. The potential of this approach to enhance learning has been confirmed by a number of authors including Friess, Oliver, Quak & Lau (2016), McMorrow (2005) and Stainfield, Fisher, Ford and Solem (2000). Carefully constructed, such virtual primers, could also be used to enable students to recognise at an early stage differences in their preconceptions of particular localities and the reality on the ground. As an example, our Brazil students report that the forests in which they work do not meet their preconception of a tropical forest (mediated by television documentaries with which they are familiar) and as a result their expectations have not been met. Seeing video of students like them (perhaps a previous cohort) undertake the activities of a field course might enable students to prepare themselves for the activities to be undertaken. By focusing on the whole residential course experience (accommodation, social experience, wider learning context, etc.) a virtual primer might help to prepare students for the challenges presented when they face the challenge of differing cultural norms (Hughes, 2016). Another strategy might be to develop a dialogue (in person or via social

media) between students who have undertaken fieldwork and those about to undertake it. Enabling students to gain a realistic understanding of a field course from near-peers is likely assist in the formation of more realistic preconceptions/expectations to a greater extent than through a dialogue with tutors. Either way, reserving the more challenging fieldwork tasks (such as independent projects) to after an initial acclimatisation period is likely to be beneficial in mitigating student anxieties.

Building motivation and engagement through autonomy

Our data demonstrate that the self-reported motivation of our students to engage with fieldwork based learning varies from person to person and from day to day. The subtleties of the underlying causal agents and the diversity of responses of individual students (Ishii, Gilbride & Stensrud, 2009) almost certainly preclude the development of a magic bullet to ensure the high levels of motivation/engagement that we might desire. However, one clear message that does arise from our analysis is that students report themselves as being more motivated when they are afforded an opportunity to work independently in their project groups and perceive themselves to have a level of individual ownership of their independent group based learning. A similar finding was reported by Goulder and Scott (2009) in the context of pre-certificate stage (level 3) undergraduate one-day field trips and described by Scott (2017) in the context of classroom based learning. In support of this argument Porter, King, Goodkin and Chan (2012) have reported that although students undertaking a short day field excursion believed that their experience was useful in the context of their learning, they were dissatisfied that the experience did not offer them an opportunity to undertake independent active experimentation and learn through direct personal experience. The wider literature highlights ownership as an important aspect of motivation in education through the related constructs of interest, value and intrinsic motivation (Komarraju & Nadler, 2013). Its wide-spread importance suggests that the link between independence and engagement/motivation is a general phenomenon that should be incorporated into all learning activities at an appropriate level.

Involvement in authentic learning experiences such as placement-based learning or independent research are understood to assist students in the development of learning autonomy by enhancing self-efficacy and self-regulation (Smyt et al., 2016; Tytler, 1992). Field courses provide an opportunity for this to happen in the context of the environmental sciences, particularly if it is designed to incorporate ‘industry-standard’ fieldwork protocols and an element of student-designed research. Research-based learning in a field course context is well established (e.g. Boyle, Ryan & Stokes, 2009) and so our over-arching recommendation that to be effective a field course should

include a guided learning phase (when students learn how to conduct field work) and an independent learning phase (when students carry out their own fieldwork project) is not in itself novel. But our nuanced observation of the affective and conative responses of our own students to these activities *within* a field course suggests to us that to be really effective three things are important. Firstly, the guided learning phase should include appropriate elements of ownership. Students could for example be allowed some lee-way to determine some of the details of the tasks at hand (for example what species/samples to focus on or where to sample e.g. Goulder & Scott, 2009). Secondly, students should understand the link between the preparatory and independent phases, and independence should increase between them in a scaffolded way. In short, ownership is important, but student-choices should be structured, limited and supplemented to ensure that the student's sense of self-efficacy is not overwhelmed (Baeten, Struyven, & Dochy, 2013). For example, in one case study, geography, earth and environmental sciences students early on in their academic careers benefit from being given a topic for their project; as this task can easily overwhelm students new to the subject and the autonomy required in project-based learning (Harmer & Stokes, 2016). Finally, it is important that work labelled as independent is actually independent. In our case studies this was not fully the case in Brazil (see figure 1) and as a result the expectations of our students were not fully met and their motivation was reduced.

Conclusions and practitioner recommendations

In conclusion we suggest that an effective field course will be one for which students are adequately prepared and have realistic expectations, one which incorporates research based learning in a transparent and scaffolded way to maximise students understanding of their ownership of their learning, and one that has built into it an element of structured reflection and the space for both tutors and students to respond to the substance of those reflections in a constructive way. Based on the discussion above we suggest the following practices may support these outcomes:

- Regular use of 'indoor' preparation or local field resources to practice core field-skills.
- Support preparation for residential fieldtrips with 'mixed-media' or virtual primers to match student expectations to fieldtrip reality.
- Reserving the more challenging fieldwork tasks (such as independent projects) to after an initial acclimatisation period to mitigate student anxieties.
- Allowing room for student ownership of outcomes during both the guided and independent stages (e.g. methods, choice of study organism, or sub-disciplinary focus).
- Increasing the level of student ownership of learning as the field course progresses.

- Incorporating longitudinal reflective activities help students consolidate progression on learning outcomes, particularly for 'tacit' skills, maximising the benefits of fieldwork activities.

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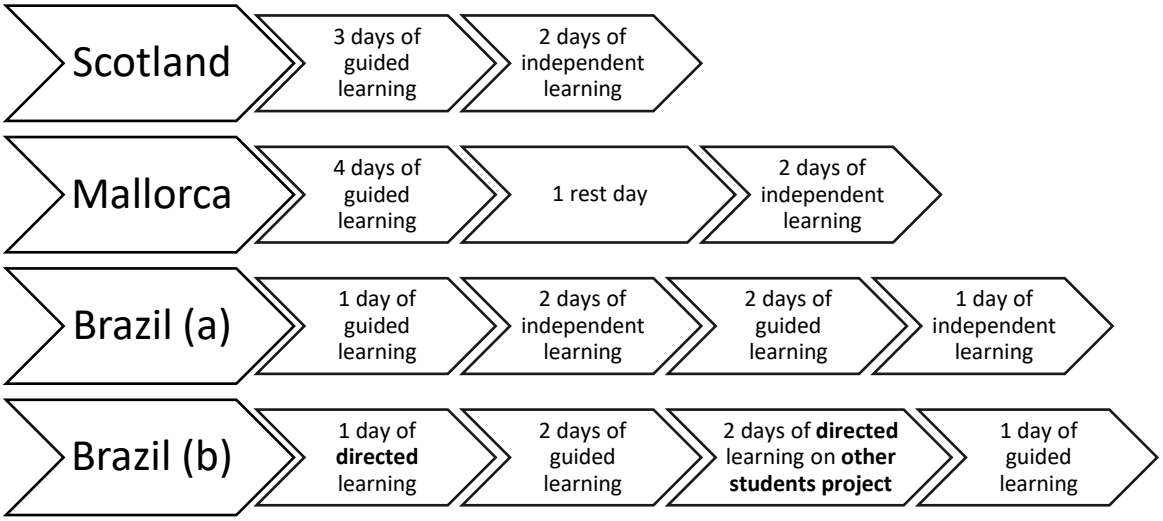
Figure 1. The structure of the three field trips. Brazil (a) is the structure we believed to be in place prior to this study, Brazil (b) is our reconceptualised structure as a result of the study.

Figure 2. Word clouds capturing the views of students pre/post participation in the field trips. Larger font indicates number of responses. Within each of figures a-f words are sized to scale and directly comparable. Between figures words are not necessarily to scale and therefore not necessarily directly comparable, however the relative importance of words can be compared between figures.

Table 1. The table shows how many of the students taking each field course made reference to one of the six main themes. Individual students may have mentioned multiple themes. The figures in parentheses indicate the number of positive and negative references respectively; so 6 (5,1) indicates that a total of 6 students mentioned a theme, 5 in a positive context and 1 in a negative context.

Table 2. Themes arising from daily reflections in the affective and conative domains. Figures represent the number of statements recorded and the numbers of students making a statement in reflections in each category (i.e. 26 (11) indicated that 26 individual reflections were made by 11 students). P values are derived from exact binomial tests which assume a 1:1 ratio of possible outcomes.

Table 3. Themes arising from daily reflections in the affective and conative domains prior to either guided or independent learning activities. Themes highlighted in bold text are those that were considered as commonly arising in those categories that included a larger number of reflections.



753

754 Figure 1. The structure of the three field trips. Brazil (a) is the structure we believed to be in place
755 prior to this study, Brazil (b) is our reconceptualised structure as a result of the study.

a. Scotland pre trip (11) | b. Scotland post trip (11)

c. Mallorca pre trip (12) | d. Mallorca post trip (10)

e. Brazil pre trip (10) | f. Brazil post trip (10)

Figure 2. Word clouds capturing the views of students pre/post participation in the field trips. Larger font indicates number of responses. Within each of figures a-f words are sized to scale and directly comparable. Between figures words are not necessarily to scale and therefore not necessarily directly comparable, however the relative importance of words can be compared between figures.

Table 1. Why this trip? Themes arising from the responses of 35 students.

	Scotland (n11)	Mallorca (n13)	Brazil (n11)
Biology	5 (5,0)	9 (9,0)	10 (10,0)
Location	6 (5,1)	5 (3,2)	10 (10,0)
Cost	5 (4,1)	5(5,0)	1 (1,0)
Novelty	0	1 (1,0)	7 (7,0)
Employability	2 (2,0)	2 (2,0)	4 (4,0)
Climate	3 (0,3)	1 (1,0)	0

Table 1. The table shows how many of the students taking each field course made reference to one of the six main themes. Individual students may have mentioned multiple themes. The figures in parentheses indicate the number of positive and negative references respectively; so 6 (5,1) indicates that a total of 6 students mentioned a theme, 5 in a positive context and 1 in a negative context.

Location	Learning activity	Affective positive	Affective negative	P	Conative motivated	Conative not motivated	P
Scotland	Guided	26 (11)	6 (5)	**< 0.001**	26 (11)	7 (7)	**< 0.01**
	Independent	19 (10)	2 (1)	**< 0.001**	18 (11)	1 (1)	**< 0.001**
Mallorca	Guided	51 (13)	2 (2)	**< 0.001**	43 (13)	10 (8)	**< 0.001**
	Independent	12 (10)	4 (4)	0.08	14 (10)	2 (2)	**< 0.01**
Brazil	Guided	15 (9)	12 (8)	0.70	19 (10)	10 (5)	0.13
	Independent	16 (10)	5 (5)	**< 0.05**	15 (9)	6 (5)	0.08

Table 2. Themes arising from daily reflections in the affective and conative domains. Figures represent the number of statements recorded and the numbers of students making a statement in reflections in each category (i.e. 26 (11) indicated that 26 individual reflections were made by 11 students). P values are derived from exact binomial tests which assume a 1:1 ratio of possible outcomes.

Location	Learning Task	Positive Affect	Negative Affect	Motivated	Not Motivated
Scotland	Guided Learning	**Peaceful environment, nice scenery,** feeling relaxed, nostalgic (remembering childhood experience in similar paces). Connection to site and lack of intrusion by 'public'.	Anxiety about working with new people and working on new material. Traffic is an intrusion.	Nice location and people. Nice weather. **Keen to learn about organisms and habitats involved.** Confident in own abilities.	Rain. Working with 'strangers'. Would like coffee (basic needs not being met).
	Independent Learning	Peaceful environment, nice scenery and weather. Connection to site and lack of intrusion by 'public'.	Worried about risk of sunburn. Disheartened at own progress.	**Drive to collect data for project. Ownership of project.** Feeling prepared for work and confident in own abilities. Good weather.	Worried about lack of data.
Mallorca	Guided Learning	**Peaceful environment, nice scenery,** feeling relaxed, nostalgic (remembering childhood experience in similar paces). Enthusiasm for habitats/organisms in a functional ecosystem.	Boredom. Site spoiled by proximity of industry.	Enthusiasm for organisms/habitats involved. **Novelty (site, species, skills).** Nice scenery. Nice weather.	**Tourists are having fun/relaxing** – would like to join in. Too hot. Tired
	Independent Learning	Peaceful environment, **nice scenery**.	**Pollution/litter etc detracts from 'beauty' of site**. Personal illness and sadness.	**Driven to understand topic at hand. Ownership of project. Drive to collect data. Intrinsic interest in topic.**	Tired. Tourists are having fun – would like to join in.
Brazil	Guided Learning	**Peaceful and beautiful area**. Novelty of sights and sounds. Isolation from built-up areas.	Tired and hot. **Anxious about the environment, insects, spiders and illness.** Not a pristine forest. Expectations not met.	**Novelty of habitats and species**. Opportunity to explore and learn new things. Intrinsic interest in biota. Nice weather.	Tired, poor weather, feel unwell, anxiety about surroundings and unseen dangers.
	Independent Learning	**Feels like a tropical and exotic rain forest.** Relaxing sounds of forest.	Habitat drier and less species rich than expected. Area too built up (not rainforest).	Nice scenery. **Novelty (species, habitats and skills).** Collecting own data.	Tired. Lack of organisation. Not working on own project. Repetitive task (data collection)

Table 3. Themes arising from daily reflections in the affective and conative domains prior to either guided or independent learning activities. Themes highlighted in bold text are those that were considered as commonly arising in those categories that included a larger number of reflections.